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Rivers of gas could provide part of universe's 'missing matter'

An Ohio astronomer and her colleagues have detected a type of hot gas in space that could account for part of the "missing" matter in the universe. A gas cloud, one trillion times more massive than our sun and more than 150 times hotter, surrounds our local group of galaxies, the astronomers reported in the journal Nature. Though vast, this gas cloud is only part of larger rivers of gas that wind between all the galaxies of the universe.

From Ohio State University:

RIVERS OF GAS COULD PROVIDE PART OF UNIVERSE'S "MISSING" MATTER

COLUMBUS, Ohio – An Ohio State University astronomer and her colleagues have detected a type of hot gas in space that could account for part of the "missing" matter in the universe.

A gas cloud, one trillion times more massive than our sun and more than 150 times hotter, surrounds our local group of galaxies, the astronomers reported in the journal Nature.

Though vast, this gas cloud is only part of larger rivers of gas that wind between all the galaxies of the universe, said Smita Mathur, associate professor of astronomy at Ohio State.

Scientists believe that after the Big Bang, only 20 percent of the "normal" material in the early universe -- such as protons and neutrons -- converged to form stars and galaxies as seen in the night sky. The remaining 80 percent of this normal matter, which astronomers refer to as baryons, hasn't been accounted for.

A related mystery concerns dark matter, unseen material that is believed to provide most of the gravity in the universe.

Mathur said that astronomers aren't sure what dark matter is made of, but that baryons can be used as a marker to find it.

"We believe baryons are drawn to the gravity of the dark matter, so they trace the location of dark matter through space," Mathur said. "One provides a map to the other."

Mathur collaborated with lead author Fabrizio Nicastro and his colleagues at the Harvard-Smithsonian Center for Astrophysics, including Andreas Zezas, Martin Elvis, Cesare Cecchi-Pestellini, Douglas Burke, Jeremy Drake, and Piergiorgio Casella; and Fabrizio Fiorre of the Astronomical Observatory of Rome.

Last summer, Mathur and her colleagues announced preliminary evidence of baryonic gas found with NASA's Chandra X-ray Observatory. In Nature, they now report definitive evidence of the gas taken with NASA's Far Ultraviolet Spectroscopic Explorer (FUSE).

"This gas is so hot that it radiates at energies too high to be seen at visible wavelengths, so we had to look at it in the ultraviolet," Mathur explained. They examined the gas surrounding the Milky Way and Andromeda galaxies, part of our local group of galaxies.

The high temperature explains why so many baryons are invisible today. At some point after the Big Bang, the baryons collided and ignited in a "heat

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shock" that created so much energy as to render the particles invisible.

But the finding doesn't answer questions about the composition of dark matter. Some scientists have hypothesized that dark matter is made up of dim stars and large gas planets similar to our Jupiter; others believe it is made of tiny but massive particles.

"Either is still a possibility," Mathur said.

She and her collaborators would hope to probe the gas again with Chandra, to perform the same kind of in-depth analysis they did with FUSE.

This research was partly supported by NASA-Chandra grants and a NASA-Chandra X-ray Center contract.